

What is claimed is:

1. A radiation detector for detecting a spatial distribution of incident radiation, comprising:

- 5 a radiation-sensitive semiconductor;
 a common electrode formed on one surface of said semiconductor for receiving a bias voltage;
 a plurality of split electrodes formed on the other surface of said semiconductor for outputting, as electric
10 signals, charges generated within said semiconductor by the incident radiation; and
 a light irradiating mechanism for emitting light at least during a detection of the radiation.

15 2. A radiation detector as defined in claim 1, wherein said light has a wavelength shorter than a wavelength corresponding to a band gap energy of said semiconductor used.

20 3. A radiation detector as defined in claim 1, wherein said light has a wavelength shorter than a wavelength that halves a transmittance of said semiconductor used, and longer than a wavelength corresponding to a band gap energy of said semiconductor.

25

4. A radiation detector as defined in any one of claims 1 to 3, wherein said semiconductor comprises an amorphous material selected from non-dope selenium or non-dope selenium compound, selenium or selenium compound doped with As or Te, selenium doped with an alkali metal, a selenium compound doped an alkali metal, selenium doped with a halogen, a selenium compound doped with a halogen, and selenium or selenium compound doped with a combination of As, Te, an alkali metal and a halogen.
- 10
5. A radiation detector as defined in any one of claims 1 to 3, wherein said semiconductor comprises a polycrystalline material selected from compound semiconductors such as CdTe, CdZnTe, PbI₂, HgI₂, TlBr and GaAs, and said compound semiconductors doped with a halogen.
- 15
6. A radiation detector as defined in any one of claims 1 to 3, wherein said light irradiating mechanism includes planar light guide means, and linear light emitting means attached to some ends of said planar light guide means.
- 20
7. A radiation detector as defined in claim 6, wherein said planar light guide means includes a light diffusing sheet, a light reflecting sheet, and a transparent plate interposed therebetween, said light diffusing sheet being disposed oppo-
- 25

site said split electrodes.

8. A radiation detector as defined in claim 6, wherein said linear light emitting means is a direct light emitting device
5 for directly radiating light of a particular wavelength.

9. A radiation detector as defined in claim 6, wherein said linear light emitting means is an indirect light emitting device combined with a phosphor for indirectly radiating
10 light of a particular wavelength according to said phosphor.

10. A radiation detector as defined in any one of claims 1 to 3, wherein said light irradiating mechanism includes planar light emitting means.

15

11. A radiation detector as defined in claim 10, wherein said planar light emitting means comprises a direct light emitting device arranged in a plane for directly radiating light of a particular wavelength.

20

12. A radiation detector as defined in claim 10, wherein said planar light emitting means is formed directly on a transparent substrate.

25 13. A radiation detector as defined in claim 10, wherein

said planar light emitting means comprises an indirect light emitting device combined with a phosphor for indirectly radiating light of a particular wavelength according to said phosphor.

5

14. A radiation detector as defined in claim 13, wherein said planar light emitting means has a substrate acting as a light emitting surface thereof, said split electrodes being formed on an upper surface of the said planar light emitting means, said semiconductor being formed over said split electrodes.

10

15. A radiation detector for detecting a spatial distribution of incident radiation, comprising:

15

a radiation-sensitive semiconductor;

a common electrode formed on one surface of said semiconductor for receiving a bias voltage;

a plurality of split electrodes formed on the other surface of said semiconductor for outputting, as electric

20

signals, charges generated within said semiconductor by the incident radiation;

a carrier selective intermediate layer formed at least between said semiconductor and said split electrodes; and

a light irradiating mechanism for emitting light at

25

least during a detection of the radiation.

16. A radiation detector as defined in claim 15, wherein said light has a wavelength shorter than a wavelength that halves a transmittance of said intermediate layer.

5

17. A radiation detector as defined in claim 16, wherein said light has a wavelength shorter than a wavelength that reduces the transmittance of said intermediate layer to 10%.

10 18. A radiation detector as defined in any one of claims 15 to 17, wherein said intermediate layer comprises an amorphous material selected from non-dope selenium or non-dope selenium compound, selenium or selenium compound doped with As or Te, selenium doped with an alkali metal, a selenium compound doped an alkali metal, selenium doped with
15 a halogen, a selenium compound doped with a halogen, and selenium or selenium compound doped with a combination of As, Te, an alkali metal and a halogen.

20 19. A radiation detector as defined in any one of claims 15 to 17, wherein said intermediate layer comprises a polycrystal of one of compound semiconductors of Sb_2S_3 , CeO_2 , CdS , CdSe , CdTe , CdZnTe , ZnSe , ZnTe , ZnS , PbI_2 , HgI_2 , TlBr and GaAs , one of said compound semiconductors doped with a
25 halogen, or a combination of said polycrystals forming multi-

ple layers.

20. A radiation detector as defined in claim 18, wherein
said semiconductor comprises an amorphous material
5 different from said intermediate layer and selected from
non-dope selenium or non-dope selenium compound,
selenium or selenium compound doped with As or Te,
selenium doped with an alkali metal, a selenium compound
doped an alkali metal, selenium doped with a halogen, a
10 selenium compound doped with a halogen, and selenium or
selenium compound doped with a combination of As, Te, an
alkali metal and a halogen.

21. A radiation detector as defined in claim 19, wherein
15 said semiconductor comprises an amorphous material
selected from non-dope selenium or non-dope selenium
compound, selenium or selenium compound doped with As
or Te, selenium doped with an alkali metal, a selenium
compound doped an alkali metal, selenium doped with a
20 halogen, a selenium compound doped with a halogen, and
selenium or selenium compound doped with a combination
of As, Te, an alkali metal and a halogen.

22. A radiation detector as defined in claim 19, wherein
25 said semiconductor comprises a polycrystalline material

different from said intermediate layer and selected from compound semiconductors such as CdTe, CdZnTe, PbI₂, HgI₂, TlBr and GaAs, and said compound semiconductors doped with a halogen.

5

23. A radiation detector as defined in claim 15, wherein said intermediate layer is formed at least between said semiconductor and said split electrodes by using a material having a threshold wavelength of transmittance between a wavelength that halves a transmittance and a wavelength
10 corresponding to a band gap energy of said semiconductor.

24. A radiation detector as defined in claim 23, wherein said semiconductor comprises an amorphous material
15 selected from non-dope selenium or non-dope selenium compound, selenium or selenium compound doped with As or Te, selenium doped with an alkali metal, a selenium compound doped an alkali metal, selenium doped with a halogen, a selenium compound doped with a halogen, and
20 selenium or selenium compound doped with a combination of As, Te, an alkali metal and a halogen, and said intermediate layer comprises a polycrystal of one of compound semiconductors of Sb₂S₃, CeO₂, CdS, CdSe, CdTe, CdZnTe, ZnSe, ZnTe, ZnS, PbI₂, HgI₂, TlBr and GaAs, one of
25 said compound semiconductors doped with a halogen, or a

combination of said polycrystals forming multiple layers.

25. A radiation detector as defined in any one of claims 15 to 17, 23 and 24, wherein said light irradiating mechanism
5 includes planar light guide means, and linear light emitting means attached to some ends of said light guide means.

26. A radiation detector as defined in claim 25, wherein
said planar light guide means includes a light diffusing
10 sheet, a light reflecting sheet, and a transparent plate interposed therebetween, said light diffusing sheet being disposed opposite said split electrodes.

27. A radiation detector as defined in claim 25, wherein
15 said linear light emitting means is a direct light emitting device for directly radiating light of a particular wavelength.

28. A radiation detector as defined in claim 25, wherein
said linear light emitting means is an indirect light emitting
20 device combined with a phosphor for indirectly radiating light of a particular wavelength according to said phosphor.

29. A radiation detector as defined in any one of claims 15 to 17, 23 and 24, wherein said light irradiating mechanism
25 includes planar light emitting means.

30. A radiation detector as defined in claim 29, wherein
said planar light emitting means comprises a direct light
emitting device arranged in a plane for directly radiating
5 light of a particular wavelength.

31. A radiation detector as defined in claim 29, wherein
said planar light emitting means is formed directly on a
transparent substrate.

10

32. A radiation detector as defined in claim 29, wherein
said planar light emitting means comprises an indirect light
emitting device combined with a phosphor for indirectly
radiating light of a particular wavelength according to said
15 phosphor.

33. A radiation detector as defined in claim 32, wherein
said planar light emitting means has a substrate acting as a
light emitting surface thereof, said split electrodes being
20 formed on an upper surface of the said planar light emitting
means, said semiconductor being formed over said split
electrodes.

34. A radiation detector as defined in any one of claims 1 to
25 3, 15 to 17, 23 and 24, wherein said semiconductor is formed

on a TFT substrate having thin film transistor switches, charge storage capacitors and said split electrodes formed on a transparent substrate.

5 35. A radiation detector as defined in claim 34, wherein said split electrodes are transparent or translucent to said irradiating light.

36. A radiation detector as defined in any one of claims 15
10 to 17, 23 and 24, wherein said semiconductor and said intermediate layer are formed on a TFT substrate having thin film transistor switches, charge storage capacitors and said split electrodes formed on a transparent substrate.

15 37. A radiation detector as defined in claim 36, wherein said split electrodes are transparent or translucent to said irradiating light.

38. A radiation detector as defined in any one of claims 1 to
20 3, 15 to 17, 23 and 24, wherein said light irradiating mechanism is controlled by an on/off switch to emit light.

39. A radiation detector as defined in claim 38, wherein light emission from said light irradiating mechanism is controlled by a control unit.
25

40. A radiation detector as defined in claim 39, wherein
said control unit controls said light irradiating mechanism
to emit light continuously or in pulse irrespective of an
5 incidence of radiation.

41. A radiation detector as defined in claim 39, wherein
said control unit controls said light irradiating mechanism
to emit light only during an incidence of radiation.

10 42. A radiation detector as defined in claim 39, wherein
said control unit controls said light irradiating mechanism
to emit light immediately after cessation of an incidence of
radiation until a next incidence of radiation.